

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Innovation in the Broadcast Television Bands:)	ET Docket No. 10-235
Allocations, Channel Sharing and)	
Improvements to VHF)	

COMMENTS OF ION MEDIA NETWORKS INC.

I. INTRODUCTION

ION Media Networks, Inc. (“ION”) is the last remaining truly independent national broadcast network, unaffiliated with a domestic or foreign media conglomerate. Since our entire business is in television broadcasting, ION has striven to lead the industry in developing innovative ways to deliver television and other wireless content to consumers, while collaborating with other broadcasters, distributors, content producers, consumer advocates and regulators to maximize the benefits of those services to the public. ION has a demonstrable track record of launching services that respond to the Commission’s stated twin policy objectives of (1) ensuring that America “keeps pace with the global wireless revolution” and (2) preserving broadcast television as a “healthy, viable medium.” *Notice* at 1.

Examples of ION’s ability and willingness to identify a consumer need, listen to the views of other media, consumer, and regulatory stakeholders, and succeed in delivering bipartisan and cross-industry solutions include:

- In discussions with consumers and cable operators, ION was urged to deliver more mainstream and higher quality entertainment programming. In response, ION Television was relaunched with broad contemporary consumer programming appeal, and is now a top-10 ranked U.S. TV viewing destination, according to Nielsen ratings of U.S. cable networks.
- Both of the nation’s DBS services asked ION to help develop a joint “win-win” approach for launching high definition local channels across the country while the services were bandwidth constrained and still putting their satellite capacity in place. We worked it out and have enjoyed collaborative relationships for years.
- The two major Telco TV services have embraced ION’s full suite of three 24/7 television channels, including special interest programming for families, kids and seniors. In each case, we have been in business from day one on all services.
- The Commission asked ION to be a leader in increasing the amount of educational and informational children’s programming across the country.

ION enthusiastically supported the effort, with the groundbreaking launch of “qubo,” a 24/7 free, broadcast children’s channel with more E/I content than any other broadcast network – in time for the digital transition. Qubo was and remains the only network of its kind in America, and continues to receive acclaim from mothers and children.

- The Commission asked ION - years before a national broadband plan was even conceived - whether we could assist in developing a program for spectrum innovation and use. ION followed through and invested more R&D dollars and management time than any other media company to help develop, standardize and commercialize “point-to-multipoint” Mobile DTV technology, which uses terrestrial spectrum and DTV infrastructure for highly spectrally efficient mobile, wireless data delivery. As wireless operators will acknowledge, the primary cause of network congestion is the spectral inefficiency of their “point-to-point” network architecture for delivering video, a problem that can be solved only by substantial capital investment in additional cell sites or by offloading video traffic to more efficient networks, such as Mobile DTV. ION was the founding member of the Open Mobile Video Coalition, now with more than 900 television station members, that facilitated the standardization of the Mobile DTV technology in record time; and is a founding partner in Mobile Content Venture, a joint venture of two major networks and 12 of the leading television station groups, which will launch mobile video services across the country later in 2011.
- The Commission’s “Future of Media” task force has asked ION – as the nation’s only independent broadcaster - what we might do assist in promoting diversity and localism in media. We are working on this question and anticipate launching a program that enables content entrepreneurs in the local news and pro-consumer communities to plug into our networks to exhibit their materials and contributions.
- ION has responded to the call from the public interest sector for our industry to offer television that is “21st century-level” in quality, choice and features, yet remains affordable and accessible even to underprivileged and underbanked households. ION is developing a new wireless service - internally code named “DTVMax” - that will allow these households to receive advanced television services.

We hope that our track record of open-minded and collaborative problem solving makes ION well-qualified not only to comment on the three specific proposals raised in the Notice, but also to submit respectfully some broader observations for the consideration of the Commission and of Congress.

II. ABOUT ION MEDIA - INDEPENDENT BROADCAST INNOVATION

In a consolidating U.S. media environment, ION is the country’s only truly independent general interest broadcast television network, unaffiliated with a domestic or foreign

media conglomerate. ION has been successful in the past 24 months, not only in freeing itself from the constraints of a legacy debt load accumulated under prior management, but more importantly in re-inventing itself as a popular and innovative television provider, serving growing and diverse American audiences by delivering quality content on multiple networks across our broadcast footprint.

ION Television - Broad and Diverse Audience

ION Television serves U.S. households nationally with high-quality entertainment programming, including popular series, theatrical and made-for-television movies, and specials - all aired in high definition. While ION, as a turn-around start-up, does not have the scale of the major networks, our prime time ratings have quickly reached levels that make ION one of the ten most popular TV viewing destinations in America, as measured against all U.S. cable networks. Of note, ION has a particularly strong following among over-the-air households, women, and minorities. Approximately twenty percent of ION's ratings are generated by the estimated 40 million over-the-air viewers, who clearly value and depend on ION's high-quality program offerings.

Qubo and ION Life - Special Interest Communities

- ION has been an early innovator in offering additional free, digital channels on each of its television stations across the country, starting on Day 1 of the Digital Transition in June 2009. These services were designed primarily to serve special interest communities that may not have access to cable programming for economic or geographic reasons. Over-the-air audiences in particular commend ION for offering these digital programming services.
- Qubo is the only 24/7 television service offering only high-quality, educational and informational children's programming. Qubo counts as its partners content suppliers of the highest quality and integrity, including Scholastic (creator of "Magic School Bus") and Corus (parent to beloved elephant "Babar"), and offers more E/I children's content than any other broadcast network in America.
- "ION Life" is the country's first national, over-the-air service dedicated to active living and personal growth, including content focused on fitness, travel, sports, home improvement, and healthy living. ION Life viewers include households that do not have access to dedicated subscription channel services that cover areas such as food, health, home and garden. (Examples of the testimonials routinely received from viewers regarding both qubo and ION Life are included at Attachment 1.)

ION Technology - Consumer-focused Innovation

In addition to its growing core business of serving broadcast audiences with free, high-quality entertainment and special interest programming, ION has been a pioneering force in

the design, development and deployment of, not one, but *two* new groundbreaking spectrum-based innovations to serve U.S. consumers:

Mobile DTV - Mobile Digital Television

- After leading the Mobile DTV standards-setting effort and driving the creation of the Open Mobile Video Coalition, the broadcast industry's voice for Mobile DTV, ION has launched a free, mobile television service to 90 million Americans, currently offering mobile broadcasts of both ION Television and Qubo in the top 10 markets.
- Utilizing the open ATSC M/H technical standard, ION's mobile video services are available - free and over the air - to consumers on devices as varied as mobile phones, tablets, laptops and netbooks, without placing any burden whatsoever on the national wireless infrastructure, and thereby supporting the goals of the National Broadband Plan.

"DTVMax" - Wireless Next-generation DTV Service

- The "DTVMax" concept provides for a low-cost, wireless, advanced television service for underserved television households that includes video-on demand and DVR services. These households represent the 40 million Americans who rely solely on over-the-air television services, as well as the millions more living in underprivileged and underbanked households who cannot afford or get access to advanced television services.
- "DTVMax" will not require wiring or infrastructure beyond the one-time cost of a low-cost receiver.

III. THE NOTICE'S SPECIFIC PROPOSALS SHOULD BE EVALUATED IN THE BROADER CONTEXT IN WHICH THEY WOULD BE IMPLEMENTED.

ION believes that, conceptually, the three specific proposals described in the Notice may not be objectionable: new allocations for flexible use in the broadcast spectrum band; permission for voluntary operation of broadcast stations on shared 6 MHz channels; and measures that attempt to improve reception of VHF digital television service.

But the Notice does not provide meaningful discussion of the more important policy context and technology consequences of the very narrow tactical questions it poses. Assessing the ultimate benefit or harm from any particular spectrum plan implementation will depend on the answers to many important questions not asked in the Notice.

These questions include, for example, how and under what circumstances a broadcast station wishing to preserve its 6 MHz channel assignment may be "repacked" to a smaller and likely more crowded portion of the band. This, in turn, might render infeasible some of the very broadcast service enhancements and innovation that Congress intended to achieve in the first place with the DTV transition, such as the ones described above that ION has launched.

In general, ION believes that spectrum plan implementations that incorporate the following principals will best achieve the goals of the National Broadband Plan and serve the public interest:

- Provide each station with the option of preserving its existing 6 MHz channel assignment *or* of making its spectrum available to other parties for other uses.
- For stations choosing to make their spectrum available to others, rely first on private free market transaction mechanisms between spectrum buyers and sellers.
- For stations choosing to preserve a 6 MHz channel assignment, ensure that those stations maintain their existing real-world coverage (*i.e.*, coverage based on current consumer reception devices for home and mobile services) should channel assignment changes be made.
- Ensure that consumers, especially the 40 million Americans relying on over-the-air television, are not inconvenienced or disenfranchised from their existing television service, not just by lack of signal coverage, but also as a result of burdensome or expensive consumer equipment requirements.

These guidelines will harness the efficiency of free market mechanisms to produce the most desirable outcome for the public and the country: the continued viability of services valued by consumers; efficient reallocation of underutilized spectrum to the best, alternative use; the capture of geographic and application specific nuances that would be missed in a blunt, wholesale “repacking;” and minimal disruption to tens of millions of consumers, who only recently have had to go through the DTV Transition.

ION believes the specifics of how any spectrum implementation plan addresses these issues will be critical in determining whether it benefits, or harms, the public interest. ION believes strongly in the importance of a transparent, integrated approach, a perspective that the Notice itself has embraced. As Commissioner Copps emphasized with respect to one of the Commission’s proposals, “We need to understand the regulatory framework under which channel sharing would be allowed, the technical implications for broadcasters and viewers, and how any changes would affect over-the-air broadcasting.” *Notice* at 40. The same could, and should, be said of each of the Notice’s proposals. They therefore should be adopted only in connection with a more collaborative and holistic assessment of the future of the broadcast spectrum, as discussed below.

A. Flexible Use/New Allocations

Provisionally, ION does not oppose the adoption of flexible use allocations in the broadcast band, as long as any new use does not harm the existing coverage of broadcasters who choose to retain their 6 MHz allotment for television services, and does not inconvenience consumers wishing to receive those services.

Conceivably, a flexible use scheme that met these conditions could facilitate continued innovation in the broadcast band, both of the kind ION is launching, which falls within existing use rules, and new uses such as deployment of localized wireless broadband solutions, (e.g. 802.11, 801.22) through private spectrum joint ventures, leasing and other business arrangements. This approach appears to be what Commissioner McDowell contemplated when he stated that “any new rules allowing for more flexible uses within the TV band must leave incumbent broadcast licensees with viable opportunities to experiment with their own mix of wireless services.” *Notice* at 42.

But the devil will, of course, be in the details. Without more specifics, it is impossible to determine the potential impact of the flexible use proposal on spectrum utilization by broadcasters, such as ION, that already are making intensive use of their allotted spectrum. Even with both parties adhering to the engineering rules established by the Commission to prevent adjacent channel interference, ION has been informed that the buildout plans of certain cellular license holders will cause interference resulting in coverage losses and impaired service for both parties. In such examples, implementation based solely on the Commission’s existing rules would result both in harm to consumers and devaluation of spectrum. In such cases, ION believes the best approach is a collaborative, private market solution, based on the specific challenges of the local geography and the specific types of service envisioned.

With this example in mind, ION believes it is essential that the Commission clarify its flexible use proposal to create opportunities for broadband deployment within the broadcast band with rules that ensure implementation does not, as Commissioner Baker stated, result in a harmful “ripple effect across other users or inhibit[] future efforts.”

B. Channel Sharing

Since ION has plans to utilize all of its spectrum for traditional and advanced television services, we are unlikely to be interested in participating in the channel sharing concept on the basis described in the Notice: a voluntary agreement between two or more stations to share a 6 MHz channel. But as long as any future implementation allows each broadcaster to opt out of channel sharing and retain full use of its 6 MHz channel - and, as discussed above, protects these broadcasters from reduced service quality, coverage loss or consumer inconvenience, ION provisionally does not object to channel sharing.

ION notes that the concept is similar to the common practice of secondary affiliations on DTV multicast channels. Furthermore, we note that nothing in the existing rules prevents a station from channel sharing, *i.e.*, entering into a voluntary agreement with another station to broadcast its content on a second 6 Mhz channel. This suggests that there are additional details that have not been fleshed out, which, without more information, prevents us - either conceptually or mechanically - from making a meaningful evaluation.

We also note that the Notice acknowledges that the Commission’s channel sharing proposal may exacerbate the challenges of the current cable carriage regime. *Notice* at 11–14. ION believes any channel-sharing rules should not disrupt the existing television viewing experience, either in the channels that consumers receive today, or in the costs of pay television operators. We believe that any channel sharing implementation must ensure that

participating broadcasters continue to have at least the same carriage rights that they have today, without imposing potential new capacity or other burdens on cable systems, satellite operators and telco video providers.

C. VHF Band Improvements

The concept of improving the feasibility of the VHF band for digital broadcasts is, like the Notice's other proposals, superficially unobjectionable. But the limitations of the VHF band in many respects - generally, and particularly with respect to indoor reception and Mobile DTV reception - are well known as an immutable matter of physics. Field tests undertaken by ION, evaluations by other broadcast and non-broadcast media firms, and consumer reception problems following the DTV transition have confirmed this unfortunate fact. ION believes that any move of a broadcaster from a UHF to a VHF channel, regardless of the antenna standard adopted, would violate one of the key principals set out above, *i.e.*, that no station suffer a loss of coverage and that consumers not be inconvenienced or disenfranchised.

Improving receiver antenna standards and undertaking consumer education programs will not overcome the reality that DTV signal propagation in the VHF band is so vastly inferior to the UHF band that it can have (and, in many cases, is having) a significantly adverse competitive effect on broadcasters operating there. As explained and supported in detail in the attached Engineering White Paper by Brett Jenkins (Attachment 2), neither the limited power increases nor the adjustments to receiver antenna performance standards proposed in the Notice will be sufficient to overcome the VHF band's inherent weaknesses, particularly for indoor reception, which is how most viewers access over-the-air television. Indeed, the FCC's own Broadcast Engineering Forum provided technical data that cast substantial doubt on the ability to make meaningful improvements in VHF coverage.

Moreover, to the extent the FCC wishes to facilitate the deployment of advanced applications in the broadcast band, as discussed in the Jenkins White Paper, the VHF band is demonstrably unsuitable for Mobile DTV and will not support an acceptable Mobile DTV consumer experience.

Furthermore, even assuming that the Commission's proposals would lead to a useful consumer service in the VHF band, ION believes that they cannot be based on the assumption that consumers will be required to bear the cost of implementation of new VHF reception technology, such as an outdoor antenna or a comparably sized indoor antenna. Consumers of over-the-air television services previously were compelled to obtain new or additional equipment in order to continue to have access to broadcast television following the DTV transition completed less than two years ago. They acted in good faith in doing so and must not now be required to incur additional expense and inconvenience to avoid being disenfranchised.

Meanwhile, when the VHF service improvement proposal is considered in the broader context of other proposals raised in the National Broadband Plan, including a potential "repacking" of broadcast stations to the VHF band, it can be read to signify that the Commission intends to relocate broadcast television licensees from the UHF to the VHF band in order to repurpose the reclaimed UHF spectrum for wireless broadband. For the technical reasons

described above and in the Jenkins White Paper, and previously acknowledged by the Commission, this approach actually would reduce the availability of local broadcast television service and reduce the availability of innovative new services - with a material adverse impact on the public interest. As Commissioner Clyburn has noted in her separate statement in this proceeding, and as ION is uniquely situated to know, the most vulnerable communities continue to rely disproportionately on over-the-air television service, and also are the ones most likely to benefit from new services like the ones planned by ION. *See Notice* at 44 (stating that “communities that heavily depend on broadcast programming should not have to sacrifice those benefits in order for our Nation to attain wireless broadband services.”).

IV. THE COMMISSION SHOULD EXAMINE THE BASES FOR ITS ASSUMPTION THAT INCENTIVE AUCTIONS AND REPACKING ARE THE MOST EFFECTIVE MEANS OF ACHIEVING SPECTRUM INNOVATION GOALS.

At this early stage in the government’s evaluation of alternative spectrum sources, ION believes, as Commission Baker has suggested, that the Commission should focus on how best to achieve its desired outcome - ubiquitous broadband availability - rather than on any particular means assumed without inquiry to be capable of achieving that outcome. *Notice* at 45. Here, again, the Notice (along with other recent Commission documents, including, notably, the National Broadband Plan itself) does not present or solicit empirical data to support the Commission’s apparent view that incentive auctions are a uniquely appropriate means to achieve its stated goal.

Thus, ION believes it is important the Commission assess incentive auctions and a government-imposed repacking alongside other potential mechanisms for making spectrum available for mobile networks. These would include, for example,

- Application of secondary markets rules to broadcast licensees.
- Private band-clearing arrangements, such as those that were permitted between out-of-core broadcasters and 700 MHz licensees.
- The role of Mobile DTV services in ameliorating congestions on 3G and 4G wireless networks.
- Expansion of ancillary and supplementary service rules.

These and other mechanisms for supporting wireless broadband deployment would require further development and investigation. It is too early in the process to proceed along a single path that, in the end, may not free up substantial amounts of spectrum and at the same time could diminish investment in and, ultimately, the utility of, the broadcast service as a vibrant, integral part of American life and democracy.

V. CONCLUSION

ION appreciates this opportunity to provide both general and specific comment on the important topic of spectrum policy, and looks forward to hearing more from the Commission regarding the complex issues related to but not specifically addressed in this Notice.

Meanwhile, ION will continue to invest in spectrum R&D so that it can continue to be the leader in developing consumer value-added applications made possible by DTV. We believe this type of entrepreneurial innovation brings U.S. households the full promise intended by the Digital Transition, in which broadcasters invested approximately \$10 billion, with ION's share alone amounting to over \$100 million in technology expenditures. As described above, ION this year will complete its "DTV 4.0" product roll-out, made up of the following four services:

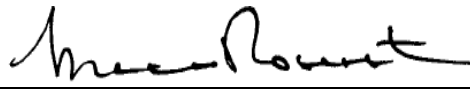
- Pristine high definition picture quality for popular entertainment programming on ION Television.
- Greater viewing choice for families and seniors to over-the-air homes at no charge, on qubo and ION Life.
- Mobile broadcast DTV, available for free on hundreds of millions of notebooks and mobile devices, without burdening the national broadband grid, due to state-of-the-art point-to-multipoint digital broadcast technology.
- The ability for lower income households to receive next-generation wireless Video-on-Demand and DVR technologies through the wireless "DTVMax" broadcast-delivered solution.

We are validated in our enthusiasm for DTV product development by recent financial analyst reports that confirm that the quality and increasing choice of DTV have resulted in the expansion of the over-the-air television category for the first time in years. As Citigroup financial analysts Jason Bazinet and Michael Rollins reported last week in their summary of the state of today's video, data and voice markets: "After falling steadily across the past few years, free-to-air households showed a slight uptick in 2010, ending at 14.7%." This implies that as many as 44 million Americans today rely on over-the-air DTV services as their primary source of television (and before counting secondary homes relying solely on free-to-air television or secondary free-to-air television sets in primary residences).

ION's primary concern is that these and future broadcast DTV innovations - such as 3D video delivery - not be harmed or put at risk either by the uncertainties surrounding the specific proposals contained in the Notice, or by the uncertainty that would ensue from a piecemeal spectrum policy approach. ION believes it is imperative that the Commission employ a holistic, transparent approach and not adopt specific proposals before it has laid out and sought public comment on the broader assumptions and goals driving this program.

Respectfully submitted,

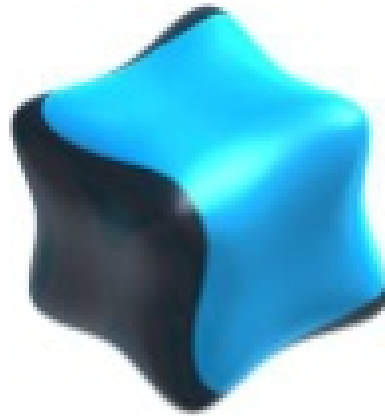
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Attachment 1



qubo

Viewer Testimonials

I Love Qubo Testimonials

- I am so happy to have a channel with shows appropriate for my 7 year old. She is too old for the preschool shows, but too young for the teen shows. I love the creativity that shows like the Magic School Bus and Jane and the Dragon encourage. I don't have to worry about my children picking up teenager phrases or watching teens as they work through boyfriends and girlfriends. Thank you. – Amy Descovich – Glen Mills, PA
- When my children ask me to watch certain TV shows on other channels I have to stop and decide whether they can watch them but all the kids have to tell me is that the program they want to watch is on Qubo and I automatically say yes the shows are of good quality I enjoy them too and they show values that I want my children to learn. - Kate Tucker - Great Falls, MT
- So refreshing to see kid shows with NO violent overkill, crude mannerisms, and strangely depicted characters with adult overtones!!! thank you QUBO for your impressions of kid-appropriate, good values upon our future generations! - Bonnie Richardson Hinkle – Atlanta, Georgia
- My 6 year old daughter loves the Qubo channel and says she likes the good characters on the shows. She said that she learns a lot from watching the Qubo channel. Thank you for making programming that is responsible and enjoyable. I never have to screen the shows she watches, unlike other "kid" networks. - Renee Rutherford - Chicago Heights, IL
- Qubo channel does not exclude caregivers and provides a family friendly environment where adults and children can enjoy watching the shows together - Robert Ortiz - Phoenix AZ
- My 7 year old daughter loves every program that comes on Qubo she sings every theme song interacts with the programs that's on when she watches her shows my daughter tells me about the stories what's going on on the episode that's showing so for that I know she pays attention that's what parents want with a great kids channel myself as a mother I join in watch it with her its easy to follow fun to enjoy fun to see what coming on next all the above I selected is exactly what it is on Qubo channel did I mention she gets excited when she asks to watch the Qubo channel - Brandon young – Scottsdale, AZ
- Qubo Channel had made a world of difference. With so many other children channels to watch with no educational value, this is one that I am comfortable in letting children watch knowing that they will be learning something worthwhile. - D. Vice – Hillsboro, OR
- It is rare in the agenda filled media today that you find a channel that is safe for your children to watch. Qubo Channel is that rare gem that does not involve violence, language or sexual innuendo. - E. MacKay – Provo, UT

- I love this channel because I don't have to worry about my children seeing or hearing anything inappropriate. The shows help reinforce the values that I am trying to teach them. - RONALDA – Dallas, TX
- I love this channel! It has a lot of my childhood favorites I want my own children to be able to see! And it has new programs that encourage adventurous and creative spirits. - ANN – Elk Grove, CA
- It is reassuring to have quality programming available to children all day - so that they can watch their programs after schoolwork is done and also to have programs directly related to books offered in our libraries. - K Newbern – Atlanta, GA
- I love the Qubo channel because I am a school counselor and I am in the process of constructing lesson plans for elementary teachers to use with our elementary students lesson plans based around various video clips found here on the Qubo website I particularly love rescue heroes turbo dogs and willa for the k-2 students and Jane and the dragon and adventures from the book of virtues for our 3rd-5th students the Qubo website is an exemplary source for engaging character-building lessons for kids - Dawn Davis - Hackett, AR
- All the shows are definitely kid friendly they promote positive values as well as educational features I can trust that what my child views on Qubo will be acceptable for hours of TV enjoyment magic school bus teaches the best science fieldtrips for any school age children turbo dogs teaches manners that I want my children to learn willas wildlife is my children's favorite too because they love animals and it interests them my five yr old likes my friend dragon mighty machines is a wonderful show that my kids love because it shows real machines in everyday life in action we love the Babar show too it is educational we all enjoy Qubo as a family because we can all sit and watch a nice show together for quality family time - Joan Huckle - Philadelphia, PA
- We love the positive messages that Qubo channel provides for our child she loves the cartoons Alfred the hedgehog mysteries and we feel she gets many valuable lessons in morality compassion kindness independence and creative thinking my husband and I are also huge fans of your night owl program we love it that you feature many of our old retro faves he man she ra and bravestar are classics that the whole family can enjoy we often tape them for our child to enjoy the next day it makes a great family connection to share with our daughter the same cartoons that we enjoyed when we were children - Sherida Campbell - Allenville, KY
- We've been let down by other child-friendly networks that promise entertaining education for children we felt like after the first season they sold out to interpersonal relationship education to appeal to the masses Qubo has been a god-send for those of us who truly value the basic skills that Qubo presents with shows like magic school bus Sheldon - Jamie Hunt - Baltimore, MD

I Want Qubo Testimonials

- As a school library volunteer, PTO literacy chairman, and event coordinator for an inner-city community center preschool, I know first-hand how important quality children's television is. Please give us the opportunity to have my daughter and her peers watch television that is WORTH watching. - Tracy Phillips – Zionsville, IN
- I'd really love for my children to have better choices than the smart mouthed, disrespectful characters currently showing on Nick and other similar channels. Please consider the effect that programming will have on future generations and add this quality channel to our lineup. - Lisa Abitante – Dunellen, NJ
- It would be great to offer a variety for kids aside from the Disney and Nick channels. This offers different type of programming and allows children to explore outside of mainstream. It would be terrific if this channel is added to cablevisions line-up. Since I have two young kids it is imperative that they can watch other programming to foster imagination, creativity and exposure to different techniques used in Qubo. Please add Qubo the kids asked me to ask you. Thanks in advance - Rebecca Richard – Bronx, NY
- As a teacher, I value TV programs that promote education to young children. There are so many cartoons that promote violence and not enough promote healthy traits that students need to be successful in life. - Amber Simons – Amarillo, TX
- Please add this educational channel to my current channels, if possible. As an educator, I feel this would be of benefit to children. Oftentimes, children watch channel networks that are inappropriate for their age. Let me know if this Qubo can be added to my list of channels I currently buy. - Susan Michael – Washington DC
- My son absolutely loves all the shows that air on Friday afternoons, and I would love for him to be able to watch this quality children's programming more often. - Sara Romero – Great Falls, MT
- This channel was one of my daughters favorites before we got bright house and losing it was a real draw back. We really love the channel and think it is a good source of learning and entertainment. - Teva Faulkenburg
- I want Qubo because my children don't need to sit around and just watch the bad things that come on TV like, grim adventures, spongebob, and Ed, edd, and eddy. Please add Qubo to the 24/7 list. - Tiffani Obannon – Millbrook, AL
- I look for quality programs that are a reflection of our children's culture and values. Qubo might be a good resource to use in my bilingual classroom. I think our area has the demographics for this kind of programming. - Maribelle Minyard – Odessa, TX

- I find it difficult to find a show that doesn't make me feel like I am losing brain cells while watching. But I really think that Qubo markets a large age group. Especially "Jane and the Dragon." I like shows that are for older teens. But many broadcasters lack these type of cartoons. I would readily watch Qubo if it was brought to this cable provider. Please bring this stimulating channel onto the channel lineup. - Rebekah Knoll – Saint Louis, MO
- I am a teacher in Henderson County and the shows available on QUBO are excellent ones to show to my second graders. If I had the channel 24/7, instead of just Saturday mornings, I would have more time to record these shows, or even turn to that channel, in class. Kids don't always get to learn academics AND values in one show, let alone many shows on one channel. Qubo allows this and does it in a very fun way. I would like to have this channel 24/7 on my channel list! It would prove to be extremely beneficial for my kids and I. - Amanda Sieg – Arden, NC
- I am a teacher. I have found QUBO channel to be the best in terms showing good morals, family values-not just virtues. In a cable world where there's more violence, rough language, and characters who act and dress older than the children suggested to watch it- QUBO gives children an invitation to be themselves. QUBO allows them to learn good characteristics and educational values. - Ana Garcia – Indianapolis, IN
- I would love to have this channel available to us, even at an additional price!! My children & I LOVE it. I love the educational & CLEAN children's shows they offer. PLEASE add this to my cable options!! - Denise Evans – Windsor Locks – CT
- Hi, We recently discovered Qubo and really enjoyed the programming. It is so different from most cartoon fare these days. But sadly we only get to see our favorite programs on Fri afternoon on ION tv.Channel 8 on our local Cox lineup (Ocala,FL). Please let us know when we will be able to enjoy our favorites all the time. - Wendi Phillips – Ocala, FL
- My children love the channel and I feel the programming is character building. I like the station enough that I will pay extra for it. I also will continue to look for it and whichever provider contains it in their programming, I will switch to it, even though that might be cable or dish. Thank you for listening. - Sonia Girod – Baton Rouge, LA
- This channel carries exclusively high quality children's programming, not any of that mindless drivel that seems to compromise so much of the other "children's" networks. WE LOVE QUBO! Please add this channel to our lineup, as many of it's programs (if not all) can only be seen on this station. - Tina Bauer – Buffalo, NY
- Qubo is such a wonderful channel for kids. It provides an alternative to the programs that are offered that aren't as "kid friendly". I hope that this is a channel that you will carry in the future. - Cole Johnson – Edmond, OK



Viewer Testimonials

I Love ION Life Testimonials



- “After switching to broadcast from cable to save money, I thought I would be missing out on my favorite programs mainly HGTV shows. But alas, I discovered ION Life and love it. I actually prefer ION Life over HGTV as the programs seem so much more like real life.” Julia Hageman of Bloomington, IN
- “A pleasant alternative to other networks, the quality of programming is usually better than other networks.” D. Moore of Broomfield, CO
- “Because I do not subscribe to cable or satellite, the movies home design and other TV programs that I have missed or not seen on other channels are a bonus for me. And these programs are worthwhile part of my day.” Leslie Wells of Englewood, CO
- “Even though I don’t have cable, I am truly pleased to watch ION Life. I enjoy the health and wellness programs, along with the movies. I especially love She’s Crafty because I am into arts and crafts and I get a lot of cool ideas from the show.” Annette Bowen of Doraville, GA
- “For someone that does not have cable, this channel has everything I need. I love the variety of programming.” Kesha McDuffie of Portsmouth, VA
- “I absolutely love your channel. It has diversity. I love the do it yourself programs, Green House and the movies. I don’t have cable for which your channel has taken the place of several channels I had previously. You have very information programs and great movies.” D. Ortiz of Kearny, NJ
- “I am able to see some great movies that I missed and other channels do not provide those moves. The movies give me an opportunity to relax while eating my dinner and when the same old repetitive style of television programs are on other stations, I watch ION Life.” Herby Toussaint of Boston, MA
- “I don’t have cable, but I get ION and ION Life on my digital TV. I love the programs on ION Life. They are healthy and creative, educational and very creative. Your doing a great job.” Angelica Gutierrez of Oakland, CA

- “ION Life programs are fun and exciting, effortless learning. I love the detailed explanation and step-by-step demonstrations that explain a variety of approaches to creativity, a greener world, life management skills and a better health for anyone.” Carolyn Davidson of Redondo Beach, CA
- “I love the programs you just can’t find anywhere else. They are motivational, educational and inspiring. In fact they have inspired me to start my own business based on personal wellness.” Katherine Helman of Culcutta, OH
- “Watching ION Life has made such a difference in my life. Learning of ways to help me be more positive in my thinking and actions. Doing Yoga with Adrienne Reed has been so wonderful. Thank you so much ION Life for making a change in me.” Rosemary O’Kelley of Memphis, TN
- “I feel like this is the best thing on TV. It offers so much and helps bring you back to family morals. Shows like Home Team, show there are people that are out there that still care about others and want to help out there fellow man.” Teresa of Portland, OR
- “I love ION Life because it is so informative about living your life well and healthy. The programs are excellent, they never bore me. I absolutely love the program She’s Crafty.” Mary Pino of Denver, CO
- “I love the fact that I can get new ideas on how to recycle materials thanks to She’s Crafty and Junk Raiders. And how to be even more green thanks to Green Matters and great vegan dishes thanks to Guiltless Gourmet. Wonderful shows all around.” Krystal Buitron of Waller, TX
- “I love to see people smiling. Every show is granting a wish, giving a home, helping them exercise, make a craft or cook a new recipe. This station has it all and it’s so great to see everyone happy. There is such a positive outlook on everything.” Monica May of Newport News, VA
- “I primarily enjoy watching the health and exercise programs that encourage healthy eating and regular daily exercise. It motivates me to want to be in shape more and be the size I was when I was 20.” Kimberly Grant of Auburndale, FL
- “It has programs that travels to other countries and you can learn a lot from these programs. I love these shows and wish they would get new ones. This is the only way I have of seeing and learning about other countries of the world.” Mary Humphrey of Kingsland, GA

Attachment 2

An Assessment of VHF Reception for Present and Future Digital Television Broadcasting Applications

Brett Jenkins
VP Technology, ION Media Networks

Executive Summary

This white paper examines the suitability of VHF channels for Digital Television Broadcasting (DTV) for both traditional television and television innovation. The key findings are:

- Two major technical hurdles—man made noise and antenna efficiency constraints—limit the suitability of the VHF band for any DTV application.
- Real world testing shows that VHF reception at a level of service and reliability envisioned by the FCC for traditional television requires viewers to adopt behavior that is very consumer unfriendly, such as the installation of very large outdoor antennas that regularly need to be re-pointed.
- Recently proposed actions by the FCC to improve the usability of the VHF band by increasing the power of VHF transmissions and requiring minimum antenna performance will at best marginally improve VHF usability for consumer applications, due to physical and practical constraints.
- As such, the intrinsic limitations of the VHF band results in poor performance and a poor consumer experience for traditional television.
- Furthermore, these limitations also make the VHF band impractical for new innovative applications of DTV broadcasting, such as mobile television, and advanced and on-demand television.

The conclusion is that the VHF bands are only useful for serving a small portion of consumers in a market place, as well as for delivering signals directly to cable head ends. Despite the desire on the part of the FCC to improve the usefulness of the band, the proposed actions will not make the spectrum consumer friendly. Finally, more prevalent use of VHF broadcast will eliminate any opportunity for broadcasters to serve mobile/portable devices by providing highly in demand video to many simultaneous users.

Introduction

This white paper examines the suitability of VHF channels for Digital Television Broadcasting, DTV. On February 7th, 2011 the FCC published a Notice of Proposed Rulemaking (NPRM) in which it asked various questions about what actions it might take to make the VHF band more suitable for broadcasters.ⁱ Implicit in this NPRM is the assumption that as currently allocated, the VHF band is not in fact well suited for DTV, a premise well established and documented in press stories following the 2009 shut down of analog broadcasting. As part of the shut down, many DTV broadcast stations moved from a UHF channel to a VHF channel causing major disruption and loss of viewership and prompting headlines such as “VHF Throws Wrench in DTV Transition.”ⁱⁱ

This paper examines the facts about VHF broadcasting. It looks at requirements for delivering broadcast television to consumers in the band, analyzes some potential actions proposed by the FCC’s NPRM, and then considers factors related to the use of the mobile DTV broadcast standard. The paper finally presents conclusions and recommendations on how broadcasters and the FCC should view the band.

Real World VHF Band Performance is Far Worse than FCC Predicted Service Levels

Television broadcast in the US uses both VHF (Very High Frequency) and UHF (Ultra High Frequency) spectrum. Furthermore, within the VHF band, television broadcasters use two sets of non-contiguous spectrum: the Low VHF band, and the High VHF band. The low VHF band comprises channels 2-6 and covers frequencies from 54MHz to 88MHz. The high VHF band comprises channels 7-13 and covers frequencies from 174MHz to 216MHz. Because they cover very different frequency ranges, these two bands have highly different technical characteristics.

Each of these bands were assigned “planning factors” by the FCC which are assumptions about the receive environment and equipment used by a consumer. These planning factors, together with the transmitter power, height and antenna patterns are used to predict whether or not TV service can be delivered at a specific location. The FCC uses the calculated prediction to judge how many TV viewers are being served by DTV broadcast. Table 1 shows the FCC planning factors and the required received signal strength in dBu based on those factors.ⁱⁱⁱ Television stations and the FCC use the number from the last row in the table to predict whether or not reception is possible using an ATSC receiver.

Planning Factor	Low VHF	High VHF	UHF
Geometric mean frequency (MHz)	69	194	615
Thermal noise (dBm) (N_t)	-106	-106	-106
Receiver noise figure (dB) (N_R)	10	10	7
Noise power at the Receiver Input (dBm) ($N_p = N_t + N_R$)	-96	-96	-99
Required C/N (dB) (Based on Threshold of Visibility determined by the ATSC system)	15	15	15
Min Signal Required at Receiver (dBm) ($P_R = N_p + C/N$)	-81	-81	-84
Downlead line loss for 50 ft. (15 m.) of coax (dB) (L)	1	2	4
Min Power at Antenna (dBm) ($P_A = P_R + L$)	-80	-79	-80
Dipole factor (dBm-dBu) dB (K_d)	-112	-121	-131
Antenna Gain (dB) (G)	4	6	10
Required Field Strength for Reception (dBu) ($FS_{min} = P_A - K_d - G$)	28	36	41

Table 1 – FCC Planning Factors and Predicted Required Signal Strength for DTV Service

The FCC made several key assumptions in creating the planning factors. The first assumption was the receiver noise figure. An analysis performed by the FCC in 2005 tested to see whether these assumptions could be validated in the real world. One of the tests was to analyze the noise figure by measuring the required signal strength at the receiver. The conclusion of this report was that on an average basis across all frequencies, the 28 receivers tested closely matched the assumed noise figure. However, specific to the low VHF band, there was a very large variation in performance of the receivers, with a standard deviation of 3.7dB.^{iv} The worst performing receiver exhibited a 21dB noise figure on channel 3^v, compared to the planning value of 10dB. Variation of high VHF performance was less, but also showed larger variations than the UHF performance of the same receivers. The FCC analysis did not give statistics of the market share of each of the receivers tested, making it impossible to draw any conclusions whether the poor performing receivers are more or less prevalent in the marketplace. Regardless, the FCC's data clearly shows that in a number of receivers, low and high VHF reception is disadvantaged compared with UHF performance on the basis of the noise figure.

The next assumption is line loss. The line loss calculation is fairly straightforward and can be estimated by knowing the length of the cable that attaches the consumer's antenna to their TV set or set top box. While there will be variation across individual consumers, a 15m length seems a reasonable assumption. However, there are other factors not taken into account in the planning factors that could create additional loss of signal between the antenna, cable and receiver, such as impedance mismatch caused when the individual components are not matched to the expected manufacturing tolerances. In practice, factors such as impedance mismatch can add up to an additional 2-5dB of loss.

The next factor is antenna gain, which can vary significantly. Not only is there a wide variation in performance based on the specific antenna used, but the gain of the antenna varies depending on the direction the antenna is pointed. Because of the ATSC standard's inherent susceptibility to multi-path interference (echoes of signals that reflect off various surfaces like buildings or objects in a room), most DTV receive antennas are designed to absorb a signal coming in from only one direction. These are called directional antennas. Most of the published data on antennas assumes that the consumer has optimally pointed their antenna directly toward the transmitting antenna. Even very small rotations can drastically reduce the antenna gain by 6dB or even as much as 10dB. Finally, while the FCC assumptions on antenna gain may be reasonable for outdoor antennas, a survey of popular indoor antennas has shown that real world performance is between 9dB to 29dB below the FCC planning factors in the high VHF band, and even worse in low VHF.^{vi}

Finally, the FCC planning factors do not take into account man-made noise which has become an increasing issue in the VHF band. Man made noise can be generated in the VHF band by electric motors, fluorescent lights, overhead power lines, and various other sources. The impact of man-made noise on low VHF was well documented prior to DTV channel elections, and man-made noise was the main reason why the low VHF band has been almost entirely abandoned for TV broadcast after the DTV transition. In the paper "Impact of Impulse Noise on DTV Reception at Low VHF", Tawil and Einolf demonstrate that "the median noise power from man-made sources could add 20 to 30 dB of noise power within the low VHF channels."^{vii} From a practical standpoint, a 20dB increase in noise power would require a 100 times increase in transmitter power to overcome.

Whereas the problems with the low VHF band were well documented, it wasn't until the DTV Transition that the same problems became apparent in the high VHF band, when consumers complained that they could no longer receive stations that had moved from UHF to high VHF. Several field experiments were subsequently conducted that identified three significant causes of loss of service: (i) low antenna gain; (ii) active antenna amplifiers that overloaded the input to the receiver; and (iii) man-made noise, whose impact in the high VHF band has been estimated in several publications at 7-10dB.^{viii}

The combination of these factors explains why real world DTV performance in the VHF band has fallen short of predictions based on the FCC planning. Consumers using an outdoor antenna are experiencing lower than expected service due to the effects of man-made noise. Consumers using indoor antennas are further penalized by much lower than assumed antenna gain. The combination of these two factors create somewhere near a 30dB penalty for low VHF and a 20dB penalty for high VHF depending on the specific consumer equipment.

To compensate for these unplanned signal losses, a stronger signal must be transmitted to achieve the original reception targets. For every 10dB of penalty, the transmitter power in an interference-free environment would need to be increased by 10 times to compensate; thus a 20dB penalty would require a 100 times increase, a 30dB would need 1000 times, and so on. However these calculations are valid only assuming no interference from nearby stations. While an increase in transmitter power increases the signal within a channel in a geographic area, it also increases the interference and reduces reception in adjacent channels and adjacent geographies.

Reliable VHF Reception Requires Consumer Unfriendly Antennas

As shown in the previous section, antenna performance has a dramatic effect on whether the VHF band can support reliable TV reception. Antenna designs are limited by certain laws of physics that require particular physical sizes in order to be effective. This is because the optimal antenna size is directly related to the wavelength of the signal, which in turn is inversely related to the frequency. Since VHF signals are lower in frequency and longer in wavelength than UHF signals, an antenna receiving VHF signals must be dramatically larger than an antenna for UHF signals to achieve the same performance.

A survey of currently available antennas with gains in the range of those specified by the FCC for VHF show that typical antenna lengths are at least 2-3 ft with widths in the range of 5-8 ft, much too large to be used indoor by consumers, and requiring an expensive rooftop antenna installation. Without an outdoor antenna, the previous section noted that consumers choosing an indoor antenna will have between a 9dB to 29dB loss in antenna gain compared to the planning factors. For many consumers, the loss makes the signal impossible to receive.

Some antenna manufacturers have marketed active antenna products, with powered amplifiers built in to the antenna in order to make up the gain lost in the antenna. Unfortunately, built-in amplifiers increase equally not only the signal but also the ambient noise, thus eliminating any benefit. In addition the amplifiers themselves can create noise, whose impact is especially bad in the VHF bands. As such, new requirements and standards for VHF antennas can at best marginally improve indoor reception.

In addition, DTV antennas are highly directional. If the antenna is not optimally pointed, reception will fall off dramatically. In DMA's where TV stations' transmissions are all located in the same general area this may not be a problem. However, in most markets there are at least some stations that are not co-located, requiring consumers to reorient the antenna whenever they want to view those channels. With an outdoor antenna, this might mean attaching a costly motor to the antenna. For indoor antennas, this requires frequent re-pointing of the antenna, which will likely eliminate the ability to perform simple consumer actions like "channel surfing."

ION Media Field Testing in Washington, DC Highlights Limitations of VHF Television Reception

As a check of consumer friendliness, ION Media Networks' engineers recently constructed a low power high band VHF transmitter under a Special Temporary Authority in the Washington, DC area. Several sites were selected at distances of 5, 10, 15, 20 and 25 miles from the transmitter and tested with both a custom designed outdoor antenna, as well as with a consumer indoor antenna purchased from a local retailer. The indoor antenna had elements for receiving both UHF and VHF transmission. The real world reception was then compared with the predicted reception levels based on FCC planning factors.

Figure 1 shows a photograph of the outdoor VHF antenna and test truck that was used for the testing.



Figure 1 – Oversized Rooftop High VHF Antenna

Figure 2 shows the consumer antenna used for indoor reception testing.



Figure 2 – Consumer Antenna Used for Reception Testing

Table 2 summarizes the test results. Note that even with the outdoor antenna, only 6 of 20 sites tested actually were able to receive the signal. More striking is that none of the sites were successful at receiving a signal with the off-the-shelf indoor consumer antenna.

Sites Tested	20
Sites with Good Reception using Oversized Rooftop Antenna	30%
Sites with Good Reception using Indoor Consumer Antenna	0%

Table 2 – Summary of Experimental Transmitter Test in Washington, DC

The results of this experiment caused the engineers to want to determine if the failures were only because the tests were done using a lower power transmitter. So further testing was conducted on a very high power VHF station, one which had increased its power as a result of consumer reception problems after the DTV transition. This station was also broadcasting in the high VHF band. The tests showed that using an outdoor antenna on a mast, reception was in fact good, with 20 out of 20 sites within 25 miles of the transmitter all receiving the signal successfully. However, using the consumer indoor antenna in an outdoor environment only half of those sites tested were able to receive the signal. When those results are extrapolated to an actual indoor environment, the number of sites with good reception would be reduced to 20%.

Success Rate using Oversized Rooftop Antenna	100%
Success Rate using Indoor Consumer Antenna (Outdoors)	50%
Success Rate using Indoor Consumer Antenna (Indoors) ^{ix}	20%

Table 3 – Summary of Tests on a High Power VHF in Washington, DC

One conclusion of this experiment is that while it may be possible for a trained television engineer with specialized equipment to make VHF reception work, the average TV consumer will have significant difficulties in a large percentage of cases even when a very, very high power transmission is used.

It has been shown here that the VHF bands, both high and low, are simply not suited to a consumer friendly service. In order to have antennas that perform to the level for which DTV broadcast was designed, the consumer must:

- (1) Have a very large antenna
- (2) Point the antenna directly at the transmitter, and move the antenna each time a new channel broadcast from a different location is selected
- (3) Not use an indoor antenna due to the required size

As evidenced by behavior after the DTV transition, these hurdles may simply be too high for consumers to continue to receive VHF channels.

Proposed FCC Actions Will Not Solve VHF Reception Issues

In the FCC's Spectrum NPRM, there are two potential courses of action for improving VHF reception. The first suggestion is to allow VHF stations to increase power to overcome the limitations of the band. There are two main problems with this approach. The first problem is that the required power increases needed to overcome the limitations are too great to be practical. The signal level increase required to meet the original service goals of the FCC is on the order of 20dB for high VHF and 30 dB for low VHF. That would require a 100 times power increase for the high VHF stations, and a 1,000 times power increase for low VHF. The technology does not exist to provide for a DTV transmitter to reach those kinds of power levels, to say nothing of the impact on the environment in terms of power consumed to run such stations or the operational cost.

The second problem is that allowing stations to increase power will increase the amount of interference caused to other VHF stations in adjacent markets. This is a self defeating solution. The increased power that helps one station necessarily creates loss for another. And in order to compensate for that loss, even more power is needed. The only way to avoid this problem would be to increase the separation distance of stations. And the net effect of increased separation distances would be fewer frequencies available for use, a situation directly at odds with the goals of the National Broadband Plan.

In the NPRM, the FCC also asks for comment on whether or not it should consider setting minimum performance standards for consumer antennas. The CEA has published a standard on recommended antenna performance called ANSI/CEA-2032-A.^x However, even a cursory look at this shows that the requirements set by this standard fall far short of the original FCC planning factors for determining service. Table 3 summarizes the requirements of this standard and compares them against the planning factors.

	Low VHF	High VHF	UHF
Planning Factor (dBd)	4	6	10
ANSI/CEA-2032-A Requirement (dBd)	-12	-8	-8
Shortfall (dB)	16	14	18

Table 3 – Shortfall of CEA Antenna Performance Specification Versus FCC Planning Factors

In examining closely the CEA antenna specification, it is apparent that the specification was developed to be a guide for what was reasonable and practical to implement for antenna manufacturers. It does not take into consideration any requirement in terms of actual DTV system performance, or consumer service levels. While it is a noble goal to attempt to improve the consumer's experience, no amount of regulation can change the simple laws of physics that govern antenna performance.

VHF Is Not Suitable for Mobile DTV

Mobile DTV is a new and exciting service that allows consumers to receive live TV on any equipped mobile or portable device, such as a mobile phone, iPad, tablet device, netbook or laptop. One of the obvious requirements for a consumer device in this space is a small or even embedded antenna. This requirement is in direct opposition to the laws of physics that dictate VHF antennas be large.

The small or even hidden antennas in Mobile DTV products start to highlight the innovation that is possible using broadcast technology. The following photos are examples of products that are currently being trialed and tested in various US cities.

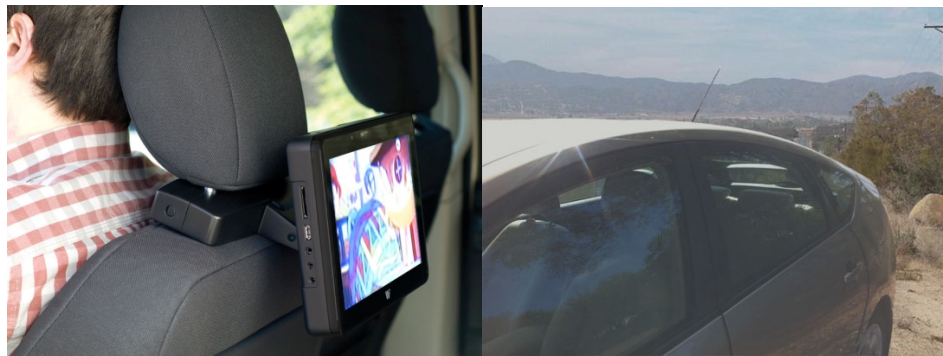


Figure 3 – Mobile DTV Receiver Mounted in a Vehicle Using an External Antenna



Figure 4 – Mobile DTV WiFi Accessory for iPad

Over the three years that Mobile DTV has been in development there have already been tremendous advancements in creating more user friendly antennas.

In the mobile DTV world, technical experts look at the problem of VHF in terms of an “antenna penalty.” The antenna penalty is the difference in gain of the antenna between the UHF band and the high VHF band. The best performing Mobile DTV receivers available today have an estimated antenna penalty of at least 20dB. This antenna penalty translates into a significantly reduced coverage area for Mobile DTV service in VHF.

A recent test was conducted in a major US city checking both indoor and outdoor Mobile DTV reception at several sites. UHF reception was successful at 74% of all sites in the coverage area. VHF reception was only successful at 15% of sites.

In analyzing unpublished data from tests in multiple cities across the US, we find that once again the laws of physics hold true. The coverage areas for mobile reception from a typical UHF station range from 15-25 miles for indoor coverage to 25-40 miles for outdoor coverage. Tests in the same cities on high VHF frequencies show that this decreases to 5-10 miles for indoor coverage and 15-20 miles for outdoor coverage using portable handheld receivers. Low VHF stations have not even been tested for mobile coverage because it is widely conceded by the entire technical community that mobile simply cannot work on low VHF channels. But test results are now showing that even high VHF will not be suitable for mobile services. The performance of VHF compared with UHF is lacking to an extent that consumers will likely not find VHF reception to be viable in enough locations to make the service attractive.

VHF Limits DTV R&D and Innovation

As the dynamics of media consumption shift, broadcast television has the potential to serve even more consumers with innovative programming and service options. DTV has already opened the door to multicast variety for over-the-air TV viewers. A recent Kagan TV count showed more than 2200 multicast channels are now available nationwide to consumers enjoying over-the-air TV. Figure 6 shows an example of existing multicast services in New York City, where more than 70 services (TV channels) are now available as free over-the-air broadcasts.

Program Guide		Tue, March 8 11:23am					
8:00pm - 9:00pm		NCIS					
		The team must protect Ziva's father when his attendance at a convention leads to surprises.					
TV-14-L-V							
Tue, 3/8	8:00pm	8:30pm	9:00pm	9:30pm	10:00pm	10:30pm	
002-01 WCBS-HD	NCIS		NCIS: Los Angeles		The Good Wife		
004-01 WNBC			The Biggest Loser 11: Couples		Parenthood		
004-02 Nonstop	Talk Stoop	NY Non...	NY Non...	Digital Li...	The Nate Berkus Show		
004-04 USports		Swimming & Diving			Cycling		
005-01 WNYW		Glee	Raising...	Traffic L...	No Information Avail...		
005-02 WNYW		Glee	Raising...	Traffic L...	FOX 5 News at 10		
007-01 WABC-DT		No Ordinary Family		V	Detroit 1-8-7		
007-02 LivWell	Treasur...	Laura ...	Mexico...	Let's Dish	Home wi...	Mirror M...	
007-03 WEATHER	Treasur...	Laura ...	Mexico...	Let's Dish	Home wi...	Mirror M...	

Figure 6 – Free Over the Air Multicast Services in New York City

In order to innovate with DTV, there needs to be a platform that has certain characteristics on which to build. One of the fundamental elements for the platform is reliable reception. If the RF link is not reliable, consumers will likely reject any service proposition. Another required element is easy installation. Finally, consumers look for form factors that are appealing. This paper has shown that VHF is not able to deliver on these three fundamental elements. Any plan that shifts more DTV service into the VHF bands will therefore limit the potential for R&D and innovation. Broadcasters continue to work on next generation broadcast technologies, including advanced and on-demand DTV services. Figure 7 shows an example of advanced wireless and wireless on demand TV services using over-the-air broadcast in a pre-commercial implementation.



Figure 7 – Wireless Advanced and On-demand TV Services Delivered with Over the Air Broadcast

Consumer friendliness becomes a critical component to any of these services, and the VHF bands will not lend themselves to the recent innovations being brought to market by broadcasters, or to the potential to serve consumers with future innovation.

Conclusions and Recommendations

In conclusion, real world testing has shown that there are several problems with the assumptions used by the FCC to determine VHF service levels for fixed television reception, particularly in the low VHF band but also in high VHF. This fact is implied in the NPRM which considers a blanket increase in power for all VHF stations. However, the amount of increase in power needed to overcome reception issues (at least a 100 times power increase in low VHF and a 20 to 40 times increase in high VHF) is simply not feasible. For mobile services, the additional impact of required portable antennas necessarily dictates that VHF reception will be penalized to an extent that service areas will be too small to be of benefit to consumers.

The conclusion therefore is that VHF reception in both the low and high bands is usable only for fixed reception, using large, directional antennas that are always pointed directly at the transmitting tower. This works for a small portion of consumers, and can also work as a delivery mechanism to cable head ends. But it cannot work as a model to build a consumer delivered digital content service.

The recommendation is that the FCC should not take any action which would require current UHF licensees to relocate to VHF unless such relocation is purely voluntary. Stations that do relocate should be given consideration as a result of the loss of consumer reach caused by the relocation. Finally, the FCC should look to reallocate VHF spectrum as part of the National Broadband Plan, to services that might be able to better use the bands for fixed, outdoor, wireless communication such as wireless backhaul or local emergency and first responder radio communication.

ⁱ “In the Matter of Innovation in the Broadcast Television Bands: Allocations, Channel Sharing and Improvements to VHF”, ET Docket No. 10-235, FCC 10-196.

ⁱⁱ <http://www.tvnewscheck.com/article/2009/06/18/33183/vhf-throws-wrench-in-dtv-transition>.

ⁱⁱⁱ FCC 97115a.

^{iv} “Tests of ATSC 8-VSB Reception Performance of Consumer Digital Television Receivers Available in 2005”, OET Report FCC/OET TR 05-1017, Nov 2, 2005, Table 4-1.

^v Ibid, Table 5-1. Worst performing receiver was 12.2 dB worse than 8.8dB = 21dB.

^{vi} <http://www.nab.org/xert/scitech/pdfs/tv051908.pdf>.

^{vii} “Impact of Impulse Noise on DTV Reception at Low VHF”, V. Tawil and C Einolf, Jr., <http://www.mstv.org/docs/techinfo.pdf>.

^{viii} <http://www.tvtechnology.com/article/85628>.

^{ix} Due to testing limitations, indoor reception results have been extrapolated from the results with the indoor antenna outdoors. The study uses a 10dB assumed attenuation factor, a very conservative estimate based on technical studies. For an explanation of indoor attenuation, see D. Lung, “DTV In the House, Part 1” <http://www.tvtechnology.com/article/18094>.

^x ANSI/CEA-2032-A.